

Exhibit 2

1 THE UNITED STATES DISTRICT COURT
2 FOR THE MIDDLE DISTRICT OF PENNSYLVANIA
3

4 -----x
5 TAMMY KITZMILLER, et al.,

6 Plaintiffs,

7 v.

CASE NO.: 04-2688

(Hon. Judge Jones)

8 DOVER AREA SCHOOL DISTRICT
9 and DOVER AREA SCHOOL DISTRICT
10 BOARD OF DIRECTORS,
11

12 Defendants.
13

14 **COPY**
15

16 Job No. 1658

Pages 1 - 358

17 DEPOSITION OF KENNETH R. MILLER, a witness
18 called by counsel for the Defendants, taken pursuant
19 to the Federal Rules of Civil Procedure before Dena
20 M. O'Brien, CSR, and Notary Public in and for the
21 State of Rhode Island, at Brown University, 171
22 Meeting Street, Room 212, Providence, Rhode Island,
23 on May 25, 2005, commencing at 9:00 a.m.
24

1 A. Yes, I'd be very happy to. Evolution is a
2 controversial issue in many areas of the country,
3 and when Dr. Levine and I first began to write
4 biology textbooks which were available for use
5 around the country, we very quickly received
6 requests from teachers, from parents and sometimes
7 from the sales representatives of our publisher to
8 explain how evolution, which I believe is covered
9 very thoroughly in our textbook, could be understood
10 in a way that didn't present a direct challenge to
11 religious beliefs.

12 Dr. Levine and I then drafted a statement,
13 which is probably four or five pages long explaining
14 how and why we covered evolutionary biology in our
15 textbook, and also that it was the view of
16 mainstream scientists, scientific institutions and
17 some of the most eminent scientific authorities in
18 the United States, including the National Academy of
19 Sciences, that evolution is in no way antithetical
20 to religion in general or to Christianity in
21 particular. And one of the things that I -- and in
22 terms of going to great lengths, in addition to
23 preparing that document, Dr. Levine and I in various
24 school districts around the country have often been

1 survey, which is a survey of animals and plants of
2 various types, and it's impossible to look at the
3 systems of the body, the physiological systems,
4 without bringing in evolution as a way to explain
5 why certain systems are the way they are or why
6 certain organisms are structured or have life cycles
7 the way that they do.

8 So evolution is found really in a great
9 deal of the book, and that's true not just of our
10 textbook but of the other competing textbooks, as
11 well.

12 Q. Now, the textbook that you wrote that
13 we've been referring to, it's your understanding
14 that the school board did, in fact, adopt that as
15 their textbook for the Dover High School?

16 A. That is my understanding.

17 Q. And that's, I believe, the 2004 edition?

18 A. That is also my understanding.

19 Q. I believe it's referred to as the
20 dragonfly book?

21 A. Yes, it is.

22 Q. I'm assuming you don't have any objections
23 with the school board making that decision?

24 A. No, I was quite pleased. I consider it to

1 be a ringing endorsement of our book.

2 Q. Now, you mentioned previously that you're
3 aware that the school had donated to them a number
4 of copies of the book "Of Pandas and People,"
5 correct?

6 A. Correct.

7 Q. And it's your understanding that that book
8 was placed in the library?

9 A. That's my understanding from reading the
10 York Daily Record.

11 Q. Do you have any objections to that book
12 being in the library?

13 A. To be perfectly honest, my feeling is that
14 the books that are placed in the library of the
15 Dover area public schools are -- what books are
16 placed in the library of the Dover area public
17 schools is a decision for the school administrators,
18 the board of education, and the people of Dover. So
19 I generally do not pass judgment, positive or
20 negative, on the books that communities and school
21 districts choose for their library.

22 Q. Do you have objection to that book being
23 referenced in the ninth grade biology class?

24 A. I will give you the same answer that I

1 more clearly towards it as an explanation?

2 A. Ideas certainly can appear and reappear
3 over time. You said as the scientific evidence
4 points towards it as an explanation. It's not clear
5 to me that the scientific evidence does point
6 towards it as an explanation, but, of course, ideas
7 can have a persistence of their own.

8 Q. Would you not agree, though, that the ID
9 advocates, for example, Professor Behe, looks at the
10 scientific evidence and he reaches the conclusion
11 that the evidence shows this concept of irreducible
12 complexity?

13 A. There is no question that Dr. Behe has
14 made an argument that is based on observations from
15 a scientific method to support the conclusion of
16 irreducible complexity. As I've explained earlier,
17 I think that conclusion is an error. I think it's a
18 misinterpretation of that data, and my analysis of
19 that is actually shared by the rest of the
20 scientific community or by most of the scientific
21 community.

22 Q. Not all of the scientific community.

23 A. Since Dr. Behe himself is a member of the
24 scientific community, I think it's fair to say that

1 he doesn't share my analysis of his ideas.

2 Q. I'm glad that you acknowledge that he's a
3 member of your scientific community.

4 A. I've never claimed otherwise.

5 Q. And I may have misapprehended something
6 you said previously, but did not Darwin himself -- I
7 think you referenced the question of irreducible
8 complexity -- he offered that as a counterhypothesis
9 to his theory?

10 A. Are you asking if Charles Darwin offered
11 irreducible complexity as a counter argument to his
12 theory?

13 Q. There was a component of his agreement
14 dealing with irreducible complexity. I believe you
15 may have quoted in -- I can find it probably in a
16 moment -- "Finding Darwin's God" that if irreducible
17 complexity was, in fact, found, then Darwin's theory
18 is doomed, I believe are the words you used in your
19 book.

20 A. Charles Darwin did not use the term
21 irreducible complexity. In "The Origin of Species"
22 he did write that -- this is a paraphrase, but it's
23 close to what he said, and we can look up the exact
24 words if you care to -- is if I could find any

1 our textbook, our textbook very clearly presents the
2 origin of life as an unsolved scientific problem.

3 I believe it mentions that the step from a
4 collection of nonliving molecules to a living cell
5 is the greatest gap in our understanding of life's
6 early history and that this is a question that
7 science cannot yet answer, and I think that's by far
8 the best way to represent it to students.

9 Q. And I believe in your report you set out
10 three primary or main propositions of the theory of
11 evolution. Let me see if I can summarize those.
12 The first being change over time, the second being
13 common descent -- and I'm not sure if I have them in
14 correct order -- and the third being the mechanism
15 of evolution, principally natural selection?

16 A. I actually stated -- the first two I think
17 you summarized just fine. The third one I stated a
18 little more broadly than you just did. The third
19 element of the theory of evolution is the
20 proposition that biological change over time is
21 driven by forces observable in the world today.

22 Q. Is that mechanism the mechanism of natural
23 selection?

24 A. I'll read from my statement because I

1 A. Well, with regard to any theory. I was
2 about to read a passage from chapter 1, page 15 on
3 the status of scientific theories, including
4 evolution. I take it you're not interested in
5 that?

6 Q. Well, obviously since this case is about
7 evolution, I want to focus on -- and that's where I
8 want to direct your specific attention. Let's go
9 back to Exhibit 12, and maybe we can organize this
10 question a little bit more clearly.

11 MR. WALCZAK: Wait, but if your question
12 is if there is any criticisms of evolution
13 and to the extent there's criticism about
14 all theories that would encompass
15 evolution.

16 MR. MUISE: Indeed.

17 MR. WALCZAK: It's unfair to just focus on
18 evolution if you've got a criticism that's
19 broader than that.

20 MR. MUISE: Well, that may be fine for
21 what you believe, but I want to get to what
22 my question was, and we were looking at
23 Exhibit 12, those two paragraphs, and I was
24 asking if he has any information beyond

1 what's in those two paragraphs and as
2 related to evolution.

3 BY MR. MUISE:

4 Q. Is this the extent of what you describe as
5 the strengths and weaknesses of evolution in these
6 two paragraphs?

7 A. No.

8 Q. Thank you. Now, to try to organize the
9 following response, I wanted to look at -- there
10 appears to be three areas that you identified in the
11 subcategory where you say that there are questions,
12 and I want to go to those three areas, and see if we
13 can identify sections that address those three
14 areas. Are you following me or --

15 A. I am.

16 Q. Okay. And then the first one that you
17 have is "Researchers still debate such important
18 questions as precisely how new species arise." That
19 appears to be the first one.

20 A. Okay.

21 Q. Do you have specific sections that you can
22 just refer us to, and I prefer just to refer to the
23 section. We don't have to read anything.

24 A. Sure, but I've got to find them first.

1 Okay. The first one was the notion of change over
2 time.

3 Q. The first one was how new species arise.

4 A. Oh, okay, how new species arise. In
5 chapter 16 on page 410, we have a heading on
6 "Studying Evolution Since Darwin," and we have two
7 what we call sea level headings, which are headings
8 in the text, one called "Limitations of Research,"
9 and one called "Unanswered Questions." I'll read
10 from Limitations of Research. "The Grants' research
11 clearly shows the effects of directional selection
12 in nature. The Grants' data also show how
13 competition and climate change affect natural
14 selection. The work does have limitations. For
15 example, while the Grants observe changes in the
16 size of the finches' beaks, they did not observe the
17 formation of a new species."

18 I will skip a little bit farther down.
19 "Evolution" -- oh, sorry. Same page, "Remember that
20 a scientific theory is defined as a well-tested
21 explanation that accounts for a broad range of
22 observations. Evolutionary theory fits this
23 definition. To be sure, many new discoveries have
24 led to new hypotheses that refine and expand

1 Darwin's original ideas. No scientist suggests,
2 however, that all evolutionary processes are fully
3 understood. Many unanswered questions remain."

4 So that passage refers specifically to the
5 issue of speciation. Now, which is the next issue
6 that you wanted me to address?

7 Q. Why species become extinct.

8 A. Now, I'm going to read a few lines from
9 page 435 relating to extinction, and the passage
10 indicates the use of hypothesis and the uncertainty
11 with respect to extinction. "During these events,
12 some biologists propose many species became extinct
13 because their environment was collapsing around them
14 rather than because they were unable to compete.
15 Under these environmental pressures, extinction is
16 not necessarily related to ordinary natural
17 selection. Until recently, most researchers looked
18 for a single major cause for each mass extinction."
19 Now, I'm going to skip a paragraph and read another
20 sentence. "Many paleontologists, however, think
21 that most extinctions were caused by several
22 factors."

23 And the cumulative effect of the passages
24 I've just read is to say biologists propose, some

1 biologists have thought single cause for major
2 extinction, other biologists propose multiple causes
3 for extinctions, and I think this illustrates the
4 idea of uncertainty as to the cause of mass
5 extinctions, as highlighted by that passage.

6 Q. And mass extinction, is that separate from
7 just -- when you're talking about extinction, does
8 mass extinction mean something different?

9 A. Yes, it does because very careful studies,
10 the diversity of life on earth, that were carried
11 out by Jack Sepkoski have indicated that at five or
12 six times in earth's natural history there was a
13 dramatic reduction in the diversity of life, as
14 Sepkoski put it, a mass dying. And these mass
15 dyings, the one with which most lay people are
16 familiar, is the last major extinction known as the
17 Cretaceous extinction in which the last dinosaurs
18 disappeared. But the greatest of all of these
19 extinctions is called the Permian extinction, and I
20 think -- I'd have to read Jack's papers again, but
21 between three quarters and two-thirds of all living
22 genera, of all categories of species, perished in
23 the Permian extinction. So it was indeed a great
24 die-out.

1 These mass extinctions are so well defined
2 and so profound that it's been widely assumed that
3 some great catastrophe must have happened to this
4 planet to cause them, and that's what these passages
5 have been about.

6 Q. Is it accurate to say, though, that the
7 question of extinction is still an open question in
8 the scientific community?

9 A. The question of exactly what caused
10 routine extinctions or these great mass extinctions
11 is indeed an open question in the scientific
12 community.

13 Q. And that would be the same with the
14 question about how new species arise? It's still
15 an open question in the scientific community?

16 A. The exact forces that produce new species,
17 how important, for example, ecological isolation
18 might be and geographic isolation might be in terms
19 of the formation of new species is indeed an
20 unsolved question in biology.

21 Q. Is it just those two factors that's an
22 unsolved question or --

23 A. No, there are always other factors and
24 what are known as reproductive isolating mechanisms,

1 the way in which one group in a population is
2 separated from another by reproductive isolation is
3 widely regarded as being essential to the formation
4 of a new species, and people disagree as to which
5 reproductive isolating mechanism is most important
6 in most cases.

7 Q. And the third category is how life began?

8 A. Right. This is one that Joe and I paid a
9 great deal of attention to.

10 Q. Why is that?

11 A. We paid a great deal of attention to it
12 because it's an area in which there is little direct
13 fossil evidence and a great deal of experimentation,
14 some of which has been controversial. So, for
15 example, we talk on page 424 of our textbook about
16 experiments done by Stanley Miller and Harold Urey,
17 and these experiments have been widely criticized by
18 people in the intelligent design community and young
19 earth creationists and just about everybody who's
20 opposed to evolution.

21 So Joe and I sat down and we read all of
22 the original papers written by Stanley Miller -- no
23 relation I should point out -- on these experiments
24 to make sure that we give a fair and accurate

1 summary of them, and what we did is to summarize the
2 Miller/Urey experiments that were done with
3 primitive earth atmospheres in the 1950s this way,
4 and the results of the experiments were spectacular.
5 Over a few days several amino acids, the building
6 blocks of proteins began to accumulate.

7 Now, a boldfaced sentence, which for our
8 book means a way of telling students this is a key
9 idea, "Miller and Urey's experiments suggested how
10 mixtures of the organic compounds necessary for life
11 could have arisen from simpler compounds present on
12 a primitive earth." Then we qualified it in a very
13 important way. I'll continue to read. "Scientists
14 now know that Miller and Urey's original simulation
15 of earth's early atmosphere were not accurate.
16 However, similar experiments based on more current
17 knowledge of earth's early atmosphere have also
18 produced organic compounds. In fact, one of
19 Miller's experiments in 1995 produced cytosine,
20 c-y-t-o-s-i-n-e, and uracil, u-r-a-c-i-l, two of the
21 bases found in RNA."

22 So that's what I mean by paying attention
23 to it because we were afraid that an uncritical
24 mention of the Miller/Urey experiments would have

1 led to the charge that we are presenting discredited
2 experiments. In fact, Stanley Miller's recent work
3 has addressed some of these issues, and he still is
4 able to produce these compounds.

5 On the next page, 425, I think is one of
6 the pages that it is very important to point out in
7 terms of how we talked about the uncertainty of the
8 origin of life. The heading on this page is called
9 "The Puzzle of Life's Origins," and the first
10 sentence reads, "A stew of organic molecules is a
11 long way from a living cell, and the leap from
12 nonlife to life is the greatest gap in scientific
13 hypotheses of earth's early history," and I think
14 that's a fair statement.

15 We then describe a number of hypotheses
16 about how first cells might have come together, and
17 midway down the page we write, "Another unanswered
18 question in the evolution of cells is the origin of
19 DNA and RNA." I'll skip a sentence, and then I'll
20 read, "How could this complex biochemical machinery
21 have evolved?" Next sentence begins, "Science
22 cannot yet solve this puzzle." Finally, in a
23 figure, figure 17-10 on the bottom of the page, we
24 summarize what most origin of life theorists and

1 experimenters would think are the essential steps of
2 going from a nonliving stew to simple organic
3 molecules to RNA nucleotides to self-replicating RNA
4 to modern genetic machinery, and as you'll see, the
5 essential steps of this are peppered with question
6 marks to indicate uncertainty. So I think we do a
7 good job of illustrating uncertainty about how life
8 first originated.

9 Q. Now, you described the strengths and
10 weaknesses. Could you not also describe a weakness
11 as a gap?

12 A. Well, you'll have to help me with exactly
13 what you mean by a gap. If by a gap you mean an
14 unanswered question, then science -- all of science,
15 not just biology, is filled with gaps because
16 science is filled with unanswered questions.

17 Q. Is it possible of those three categories
18 that we just discussed, how new species arise, why
19 species become extinct and how life began, is it
20 impossible to categorize any one of those as being
21 more controversial than the others within the
22 scientific community?

23 A. No, I don't think so. I think they're all
24 controversial but not perhaps in the sense that you

1 Q. And you don't disagree with that I'm
2 assuming?

3 A. I certainly don't disagree with that.

4 Q. Is there a reason why you left it off or
5 out of your report?

6 A. Not that I can think of. I think when I
7 took parts of the statement, I wanted to highlight
8 those parts of which I was critical. I certainly
9 did not represent this in my report as being the
10 complete statement. There would have been no point
11 in doing that since you had already provided that as
12 the answer to the complaint, and I clearly wrote in
13 the statement it said in part, indicating that I had
14 not reproduced the whole statement here.

15 Q. Does the inclusion of those additional
16 parts that I read to you change any of your opinions
17 regarding this statement?

18 A. No, it does not.

19 Q. Let's look at the statement as you
20 represented it on page eight. The first line says,
21 "Because Darwin's theory is a theory, it continues
22 to be tested as new evidence is discovered." Is
23 that statement true?

24 A. That statement is true, but it also

1 applies to all scientific theories.

2 Q. The second sentence, "The theory is not a
3 fact;" is that true?

4 A. That is a true statement. However, it's a
5 statement that seems to me to be designed to
6 mislead, and what I mean by design to mislead is no
7 scientific theory is a fact or ever becomes a fact.
8 So by singling out evolution and saying that theory
9 is not a fact, it leaves the implication that
10 perhaps there are other scientific theories that
11 are facts or are factually based, and if that was
12 the intent, that would certainly be a
13 misrepresentation.

14 Q. Would it not also be a misrepresentation
15 to confuse the term evolution with the theory of
16 evolution in claiming that evolution is a fact, and
17 what I'm saying is we've gone through and you were
18 pointing out how it's important to be precise about
19 our definitions, and there is evolution and there is
20 the theory of evolution; is that correct?

21 A. In light of our previous discussion about
22 the two meanings of the use of the word evolution,
23 that is correct.

24 Q. And evolution in the first meaning, sort

1 that explanation differs from Darwin's view, and as
2 I pointed out, Charles Darwin never published any
3 detailed theory for the explanation of the origin of
4 life beyond speculation in letters to a few other
5 scientists that life might have originated in what
6 Darwin called a warm, little pond, but a statement
7 like that hardly amounts to a theory for the origin
8 of life.

9 Q. In that statement it says, "An explanation
10 of the diversification and origin of life that
11 differs from Darwin's view." Would that be an
12 accurate statement?

13 A. I think that would be a more accurate
14 statement, yes, it would.

15 Q. The next sentence, "The reference book 'Of
16 Pandas and People' is available for students who
17 might be interested in gaining an understanding of
18 what intelligent design actually involves." Do you
19 have any problem with that statement?

20 A. No, I think the fact that the board has
21 provided that book, made it available to students,
22 and that they have characterized it as a book on
23 intelligent design, that's all a fair statement. So
24 I think that particular statement is something that

1 effectively communicates the reality of the
2 situation to students, which is we got this book,
3 it's available for you, and this book describes
4 intelligent design.

5 Q. And I believe from one of your earlier
6 statements, you would defer to the judgement of the
7 board as to such matters of what books go in the
8 library and so forth?

9 A. Yes, I certainly think as a matter of
10 principle that individual school districts should be
11 quite free to put any books in their libraries that
12 they want. Now, if I was asked instead for my own
13 scientific judgment as to how variable an education
14 resource "Of Pandas and People" would be, my
15 judgment would be very critical, and part of my
16 expert report, in fact, points out a number of
17 serious scientific errors and misrepresentations in
18 "Of Pandas and People."

19 So I would specifically if asked for
20 advice say, I don't think this is a very good book,
21 but the decision of what books to put in a library
22 and make available is of a different matter -- of a
23 different order.

24 Q. And then finally, "With respect to any



▲ **Figure 15-18** Darwin's *On the Origin of Species* presented a revolutionary view of the living world. Many scientists agree with Darwin's statement that "There is a grandeur in this view of life, . . . that . . . from so simple a beginning, endless forms so beautiful and wonderful have been and are being evolved." **Applying Concepts** *New species are continually being discovered. How could you use Darwin's theory to learn more about these new species?*

Summary of Darwin's Theory

Darwin's theory of evolution can be summarized as follows:

- Individual organisms differ, and some of this variation is heritable.
- Organisms produce more offspring than can survive, and many that do survive do not reproduce.
- Because more organisms are produced than can survive, they compete for limited resources.
- Each unique organism has different advantages and disadvantages in the struggle for existence. Individuals best suited to their environment survive and reproduce most successfully. These organisms pass their heritable traits to their offspring. Other individuals die or leave fewer offspring. This process of natural selection causes species to change over time.
- Species alive today are descended with modification from ancestral species that lived in the distant past. This process, by which diverse species evolved from common ancestors, unites all organisms on Earth into a single tree of life.

Strengths and Weaknesses of Evolutionary Theory

Scientific advances in many fields of biology, along with geology and physics, have confirmed and expanded most of Darwin's hypotheses. Today, evolutionary theory offers vital insights to all biological and biomedical sciences—from infectious-disease research to ecology. In fact, evolution is often called the "grand unifying theory of the life sciences."

Like any scientific theory, evolutionary theory continues to change as new data are gathered and new ways of thinking arise. As you will see shortly, researchers still debate such important questions as precisely how new species arise and why species become extinct. There is also uncertainty about how life began.

15-3 Section Assessment

1. **Key Concept** How is artificial selection dependent on variation in nature?
2. **Key Concept** The theory of evolution by natural selection explains, in scientific terms, how living things evolve over time. What is being selected in this process?

3. **Key Concept** What types of evidence did Darwin use to support his theory of change over time?
4. **Critical Thinking Evaluating** Use scientific evidence to evaluate Darwin's theory of evolution by natural selection.

Writing in Science

Newspaper Article

Write a newspaper article about the meeting in which Darwin's and Wallace's hypotheses of evolution were first presented. Explain the theory of evolution by natural selection for an audience who knows nothing about the subject.

1 PLEASE ATTACH TO THE DEPOSITION OF: KENNETH MILLER
DATE TAKEN: MAY 25, 2005
2 CASE: KITZMILLER, ET AL. vs. DOVER AREA SCHOOL
DISTRICT, ET AL.
3

ERRATA SHEET

4 PAGE LINE CHANGE REASON
5
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18

I have read the foregoing transcript of my
19 deposition and except for any corrections or changes
noted ~~above~~ on attached sheet, I hereby subscribe to the
transcript as

20 an accurate record of the statements made by me.

Executed this 30th day of June , 2005.

21 
22 Kenneth Miller

Kenneth Miller, Errata Sheet

Page	Line	Change (unless otherwise noted, change is for spelling error)
P. 40	L 3	Change "conflict science" to "conflate science"
P42	L18	"evolution" to "revolution"
P42	L22	"Kapernekas" to "Copernicus"
P47	L1	"chaired" to "chair"
	L3	"counsel" to "council"
P58	L24	"roll" to "enrollment"
P70	L1	"them major" to "their major"
P81	L3	"turn for" to "quick for"
P86	L13	"Penick" to "Pennock"
	L14	"Robert Behe" to "Michael Behe"
P105	L2	(and many other lines on the pages that follow) change "tenant" to "tenet"
P131	L10	"super natural" to "supernatural"
P133	L17	"An error" to "in error"
P154	L7	"wanton" to "wanting"
P160	L16	"Dempsey" to "Dembski"
P170	L12	"morals" to "laws"
P176	L2	"outside" to "result"
	L19	(and many pages that follow) "Hort" to "Haught"
P183	L4	"in the" to "in a"
P186	L8	"funding" to "finding"
	L15	"traction" to "diffraction"
	L15	"Rosalyn" to "Rosalind"
P209	L8	change "We tend to prove things out" to "We tend to rule things out"
P230	L8	change "clotted" to "clotting"
P256	L13	change "both biologists" to "most biologists"
P260	L1	change "multiple organs" to "multiple origins"
P264	L1	change "science" to "SCIENCE" (name of journal, <i>SCIENCE</i> magazine)
P267	L19	change "phylum" to "phyla"
P268	L22	change "no one the" to "no one type"
P269	L3	change "atypical" to "a typical"
P269	L7	change "Brandies" to "Brandeis"
P272	L8	change "prior ancestors" to "prior answers"
P274		change <u>all</u> occurrences of "Herald" to "Harold" (the scientist's name is <i>Franklin Harold</i>)
P275	L1	change all occurrences of "CREB" to "Krebs"
P290	L7	change "sea level" to "C-level"
P315	L1	change "penicillin molds" to "penicillium mold"
P322	L17	change "theory" to "theories"